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Technology Beyond the Dreams

ACCESSORY BOARDS

Zigbee User Manual

USER MANUAL

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Introduction

Zigbee Kit, is proposed to smooth the progress of developing and debugging of various designs encompassing of Zigbee Based applications with MCU.

Packages

- EVB-Zigbee Kit (XBee)
- Serial Port Cable
- CD contains
    - Software
    - Example Programs | User Manual

Technical or Customer Support

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1. Introduction

This Evaluation board supports Digi/Maxstream Low cost Zigbee modules. It has on-board RSSI indicators and Data flow indicators, facility to connect directly to the microcontroller or PC through RS232 interface. The XBee 802.15.4 (formerly Series 1) OEM RF module is an IEEE 802.15.4 compliant solution that satisfies the unique needs of low-power wireless sensor networks. It is easy-to-use, requires minimal power and provides reliable delivery of critical data between devices. No configuration is necessary for out-of-box RF communications. Advanced configurations can be implemented using simple AT commands.

Supported Modules

- Xbee
- Xbee-Pro

Base Board Specifications

- On-Board Voltage Regulator
- Data Flow Indicators (Rx/Tx/Assoc)
- Power ON status Indication LED.
- RSSI Level Indicators
- DB9 Connector for PC or MCU Interface.

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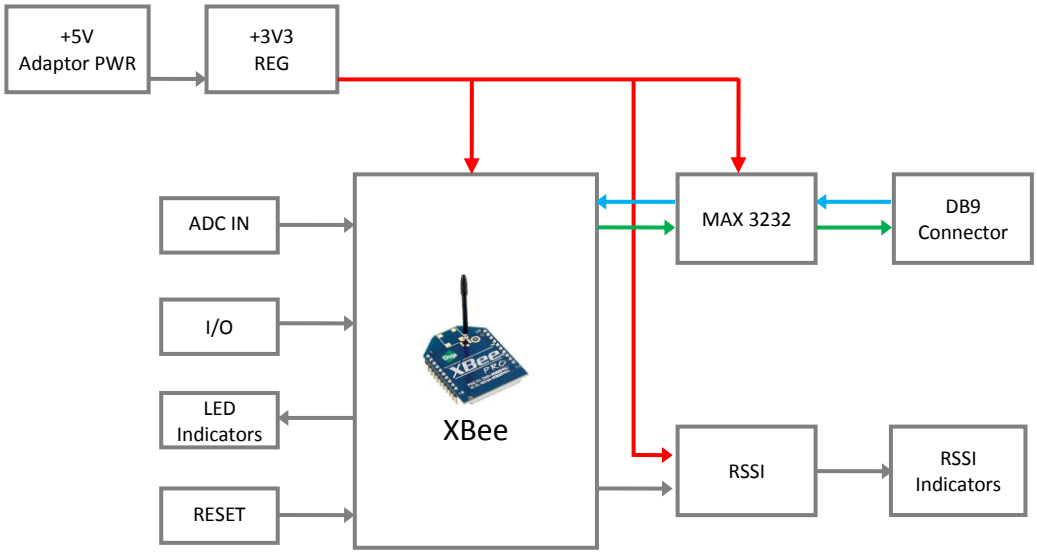
General Block Diagram



2. *Zigbee Modules (Xbee | XBee –PRO)*

The XBee 802.15.4 (formerly Series 1) OEM RF module is an IEEE 802.15.4 compliant solution that satisfies the unique needs of low-cost, low-power wireless sensor networks. It is easy-to-use, requires minimal power and provides reliable delivery of critical data between devices. Its small form factor saves valuable board space.

No configuration is necessary for out-of-box RF communications. The XBee module's default configuration supports a wide range of data system applications. Advanced configurations can be implemented using simple AT commands.

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Performance

- Transmit power output: 1mW (0 dBm) | Indoor/Urban range: Up to 100 ft (30 m)
- Outdoor/RF line-of-sight range: Up to 300 ft (100 m)
- RF data rate: 250 Kbps |Interface data rate: Up to 115.2 Kbps
- Operating frequency: 2.4 GHz |Receiver sensitivity: -92 dBm

Networking

- Spread Spectrum type: DSSS (Direct Sequence Spread Spectrum)
- Networking topology: Peer-to-peer, point-to-point, and point-to-multipoint
- Error handling: Retries & acknowledgements
- Filtration options: PAN ID, channel and addresses
- Channel capacity: 16 Direct Sequence Channels (software selectable)
- Addressing: 65,000 network addresses available for each channel
- Encryption: 128-bit AES

Zigbee Specifications

Features:

- Interoperability with ZigBee devices from other vendors*
- No configuration needed for out-of-the-box RF communications

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- ZigBee mesh networking protocol
- Self-healing and discovery for network stability

Platform	XBee® ZB	XBee-PRO® ZB
Performance		
RF Data Rate	250 Kbps	
Indoor/Urban Range	133 ft (40 m)	300 ft. (90 m) / Int'l 200 ft (60 m)
Outdoor/RF Line-of-Sight Range	400 ft (120 m)	1 mile (1600 m)/ Int'l 2500 ft (750 m)
Transmit Power	1.25 mW (+1 dBm) / 2 mW (+3 dBm) boost mode	50 mW (+17 dBm) / Int'l 10 mW (+10 dBm)
Receiver Sensitivity (1% PER)	-96 dBm in boost mode	-102 dBm
Features		
Serial Data Interface	3.3V CMOS UART	
Configuration Method	API or AT commands, local or over-the-air	
Frequency Band	2.4 GHz	
Interference Immunity	DSSS (Direct Sequence Spread Spectrum)	
Serial Data Rate	1200 bps - 1 Mbps	
ADC Inputs	(4) 10-bit ADC inputs	
Digital I/O	10	
Antenna Options	Chip, Wire Whip, U.FL, RPSMA	
Networking & Security		
Encryption	128-bit AES	
Reliable Packet Delivery	Retries/Acknowledgments	
IDs and Channels	PAN ID, 64-bit IEEE MAC, 16 channels	PAN ID, 64-bit IEEE MAC, 14 channels
Power Requirements		
Supply Voltage	2.1 - 3.6VDC	3.0 - 3.4VDC
Transmit Current	35 mA / 45 mA boost mode @ 3.3VDC	294 mA (@ 3.3V) / Int'l 170 mA (@ 3.3V)
Receive Current	38 mA / 40 mA boost mode @ 3.3VDC	45 mA @ 3.3VDC
Power-Down Current	<1 uA @ 25º C	<10 uA @ 25º C

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Pin Details of XBee | Xbee – PRO Modules

Pin #	Name	Direction	Description
1	VCC	-	Power supply
2	DOUT	Output	UART Data Out
3	DIN / **CONFIG**	Input	UART Data In
4	DO8*	Output	Digital Output 8
5	**RESET**	Input	Module Reset (reset pulse must be at least 200 ns)
6	PWM0 / RSSI	Output	PWM Output 0 / RX Signal Strength Indicator
7	PWM1	Output	PWM Output 1
8	[reserved]	-	Do not connect
9	DTR / SLEEP_RQ / DI8	Input	Pin Sleep Control Line or Digital Input 8
10	GND	-	Ground
11	AD4 / DIO4	Either	Analog Input 4 or Digital I/O 4
12	**CTS** / DIO7	Either	Clear-to-Send Flow Control or Digital I/O 7
13	ON / **SLEEP**	Output	Module Status Indicator
14	VREF	Input	Voltage Reference for A/D Inputs
15	Associate / AD5 / DIO5	Either	Associated Indicator, Analog Input 5 or Digital I/O 5
16	**RTS** / AD6 / DIO6	Either	Request-to-Send Flow Control, Analog Input 6 or Digital I/O 6
17	AD3 / DIO3	Either	Analog Input 3 or Digital I/O 3
18	AD2 / DIO2	Either	Analog Input 2 or Digital I/O 2
19	AD1 / DIO1	Either	Analog Input 1 or Digital I/O 1
20	AD0 / DIO0	Either	Analog Input 0 or Digital I/O 0

3. XBee Board Details

Power Supply

The external power can be DC source only, with a voltage (+5V/,1A output) at 230V AC input. The LM1117 Fixed +3.3V positive regulator is used to provides power to the Zigbee Modules and other peripherals. Separate slide switch is provided to power the board (ON/OFF).

RESET

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The Reset Switch is used to reset (re-boot) the RF module. This switch only applies when using the configuration tabs of MaxStream's X-CTU Software

I/O & Power LEDs

LEDs indicate RF module activity as follows:

Yellow (top LED) = Serial Data Out (to host)

Green (middle) = Serial Data In (from host)

Red (bottom) = Power/Association Indicator (Refer to the D5 (DIO5 Configuration) parameter)

Serial Port

Standard female DB-9 (RS-232) connector.

Note : *Male – Female 9-pin Straight cable (Rx-Rx | Tx-Tx)*

RSSI Indicators

RSSI LEDs indicate the amount of fade margin present in an active wireless link. Fade margin is defined as the difference between the incoming signal strength and the module's receiver sensitivity.

3 LEDs ON = Very Strong Signal (> 30 dB fade margin)

2 LEDs ON = Strong Signal (> 20 dB fade margin)

1 LED ON = Moderate Signal (> 10 dB fade margin)

0 LED ON = Weak Signal (< 10 dB fade margin)

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4. X-CTU Software

X-CTU is a MaxStream-provided software program used to interface with and configure Max-Stream RF Modules. The software application is organized into the following four tabs:

- PC Settings tab - Setup PC serial ports for interfacing with an RF module
- Range Test tab - Test the RF module's range and monitor packets sent and received
- Terminal tab - Set and read RF module parameters using AT Commands
- Modem Configuration tab - Set and read RF module parameters

Installation

Double-click the "setup_X-CTU.exe" file and follow prompts of the installation screens. This file is

located in the 'software' folder of the MaxStream CD and also under the 'Downloads' section of the following web page: www.maxstream.net/support/downloads.php

Setup

To use the X-CTU software, a module assembly (An RF module mounted to an interface Board)

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must be connected to a serial port of a PC.

NOTE: Failure to enter AT Command Mode is most commonly due to baud rate mismatch. The

interface data rate and parity settings of the serial port ("PC Settings" tab) must match those of

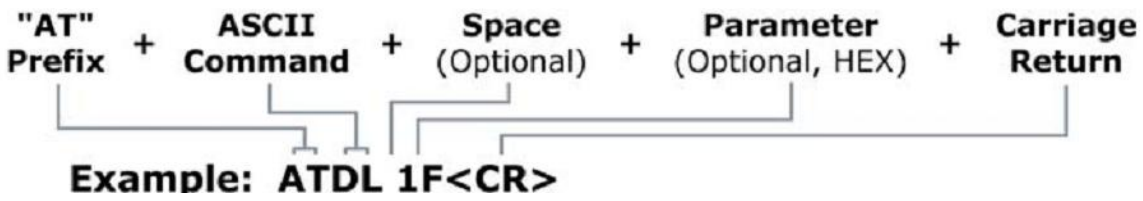
the module (BD (Baud Rate) and NB (Parity) parameters respectively).

Serial Communication Software

A terminal program is built into the X-CTU Software. Other terminal programs such as "HyperTer-

minal" can also be used to configure modules and monitor communications. When issuing AT Commands through a terminal program interface, use the following syntax:

Figure . Syntax for sending AT Commands



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NOTE:

To read a parameter value stored in a register, leave the parameter field blank.

The example above issues the DL (Destination Address Low) command to change destination address of the module to "0x1F". To save the new value to the module’s non-volatile memory, issue WR (Write) command after modifying parameters.

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